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(54) HAND TOOL FOR ASSEMBLING TUBES

(71) We, AMP INCORPORATED, a corporation organised and existing under the laws of the State of New Jersey, United States of America, of Eisenhower Boulevard, Harrisburg, State of Pennsylvania, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a hand tool for assembling together two tubular members.

The present invention is a hand tool for assembling a flanged first tubular member on to a flanged second tubular member comprising two relatively movable jaws, each jaw including a rib having a channel dimensioned to receive a respective one of the flanged tubular members such that the lateral thrust surface of the rib is engageable with a first portion of the thrust surface of the respective flange, and at least one insert having a first edge portion which in a first position of the insert complements the shape of the channel in the rib for engagement with a second portion of the thrust surface of the respective flange, the insert being pivotable about an axis extending parallel to the channel away from the first position to permit lateral entry of the tubular member into the channel.

Embodiments of the present invention will now be described by way of example with reference to the accompanying drawings, in which:—

Figure 1 is a partial perspective view of a hand tool according to the invention;

Figure 2 is an exploded view of a jaw member of the hand tool of Figure 1;

Figure 3 is an elevational view to a smaller scale of the entire hand tool of Figure 1;

Figures 4, 5, and 6 illustrates the operation of the hand tool of Figure 1; and

Figures 7 illustrates a different embodiment of the hand tool embodying features of the present invention.

The head of a hand tool comprises, as seen in Figure 1, a jaw member 24, which is attached to a handle 26, and an opposing identical jaw member 28 which is attached to a handle 30. Each jaw member includes a generally U-shaped base portion 31 integrally formed with a pair of spaced plate portions 32 defining a slot 33 seen in Figure 2. The handles 26 and 30 have respective ends received in the slots 33 and attached to the jaw members by welding.

The base portion 31 of each jaw member includes two rear spaced arms 36 defining a U-shaped channel 38 comprising a semi-circular portion and two spaced parallel portions. A generally U-shaped front plate 40 has a channel 41 similar to and aligned with the channel 38, the plate 40 having arms 42 defining with the arms 36 two recesses 43 one on each side of the aligned channels.

Aligned through holes 44 extending parallel to the axis of the channels are provided in the arms 36 and 42.

A rib 48 is provided intermediate the channels 38 and 41; i.e. adjacent the recesses 43. The rib 48 has a semi-circular channel 49.

Two generally ear-shaped inserts 50 are pivotally mounted, one in each recess 43, in opposing relation in each jaw member by means of respective pins 52 extending through the holes 44 and holes 53 in the inserts 50.

In other words, the inserts 50 are mirror images of each other and each is pivotally mounted on a pin 52 having its longitudinal axis parallel to the channel 49, the pins 52 being on opposite sides of the channel 49.

From a curved upper edge portion 54 of each insert the inside edge; i.e. the edge facing the opposite insert when they are mounted in a jaw member, extends downwardly and generally towards the other insert to a position 56 below which the edge is curved as at 58 to the same radius as rib 48 so that the edge and the channel 49 provide a smooth, continuous curved surface.

At the lower end of the curved edge sur-

face 58, the edge is shaped to provide a generally flat surface 59 which mates with a corresponding flat surface 61 on top of each leg of the rib 48. The hole 53 is provided on a flat portion presenting a curved surface 60 arcuate about hole 53. A leg portion of the insert 50 defines a flat surface 62. As is apparent from Figure 4, the curved surface 60 acts as a bearing surface between the insert and the vertical outside surface 64 of the rib 48.

The flat portions of each insert 50 are each relieved around the hole 53 to accommodate a torsion spring 68. The spring, seen in Figure 4, is wrapped around pin 52 with its legs bearing against surfaces 62 and 64 thereby biasing the lower part (below hole 53) of the insert outwardly and the upper part (above hole 53) inwardly toward the opposing insert.

Figure 3 illustrates the entire hand tool, designated by the reference numeral 70. In addition to the handle 26 and the handle 30, the latter being pivotally connected to the former by a pin 71, the tool includes an actuating lever 72 which is pivotally mounted to the handle 30, and double links 74 which are pivotally mounted to each side of the handle 26 and to the lever 72. The arrangement of the handles and linkage is such that as the lever 72 is pulled away from the handles, the jaw members 24 and 28 move away relatively from each other. As the lever is pushed in towards the handles the jaw members approach each other.

Figure 6 illustrates a tubular connecting device for which the present invention was developed. The device, used to connect two flexible pipes 80 together, comprises an elongate body 82 having a centrally positioned annular groove 84 defined by two spaced annular flanges 86 and tubular extensions 88 extending longitudinally outwardly from the flanges 86. In addition, there are two pipe insert members 90 (only one of which is shown) which are inserted into the open ends of the pipes being connected, and two ferrule members 92 which are drawn onto the extensions 88 by the hand tool 70. Each ferrule member has at one end a flange 94.

In assembling the connecting device, the ends of the pipes 80, with insert members 90 in position inside, are pushed into the bore 96 of the body 82 as seen in Figure 6. The ferrule members 92, with flanges 94 facing toward the body groove 84, are pushed onto the tubular extensions 88 by hand as far as possible. Hand tool 70 is now placed onto the partially assembled device so that a body flange 86 is on the inside of one insert and the flange 94 on a ferrule member 92 is on the inside of the opposing insert. The upper curved edge portions 56 of each pair of inserts 50 is seen to define

a convergent mouth adapted to receive the partially assembled connecting device.

With reference to Figure 4 it can be seen that the inserts 50 pivot outwardly to permit the passing therethrough of the partially assembled connecting device which comes to rest in channels 38, after which, as can be seen in Figure 5, the inserts pivot back so that the channels 49 of the ribs 48 and the surfaces 58 of the inserts 50 almost completely surround the connecting device. The outwardly directed thrust surfaces of the ribs 48 and the inserts 50 bear against the thrust surfaces of the body flange 86 and the ferrule flange 94. Subsequent to the above positioning, the lever 72 is moved towards the handles 26 and 30 and to cause the jaw member 28 to approach the jaw member 24, drawing ferrule member 92 onto tubular extension 88 the process is performed on the opposite side of the connecting device to complete the connection.

While the embodiment of Figures 1 to 6 provides a semi-circular channel 49 and curved portions 58 which together define an arc of about 315 degrees, it is clear that the tool may be designed to provide a greater or less angular contact surface as desired. For example, in the embodiment of Figure 7, the inserts 50¹ have edges which are curved as at 59¹ and are designed to abut to define with the channel 49 of the rib 48 an angular contact surface of virtually 360°.

Furthermore, although two inserts 50 are shown, it is envisaged that a single insert having a surface 58 which would extend completely round the upper half of the tubular member may be used.

WHAT WE CLAIM IS:—

1. A hand tool for assembling a flanged first tubular member on to a flanged second tubular member comprising two relatively movable jaws, each jaw including a rib having a channel dimensioned to receive a respective one of the flanged tubular members such that the lateral thrust surface of the rib is engageable with a first portion of the thrust surface of the respective flange, and at least one insert having a first edge portion which in a first position of the insert complements the shape of the channel in the rib for engagement with a second portion of the thrust surface of the respective flange, the insert being pivotable about an axis extending parallel to the channel away from the first position to permit lateral entry of the tubular member into the channel.
2. A hand tool as claimed in claim 1, in which each insert is spring biased to the first position.
3. A hand tool as claimed in claim 1 or 2, in which each jaw has a second insert which is a mirror image of the first insert



face 58, the edge is shaped to provide a generally flat surface 59 which mates with a corresponding flat surface 61 on top of each leg of the rib 48. The hole 53 is provided on a flat portion presenting a curved surface 60 arcuate about hole 53. A leg portion of the insert 50 defines a flat surface 62. As is apparent from Figure 4, the curved surface 60 acts as a bearing surface between the insert and the vertical outside surface 64 of the rib 48.

The flat portions of each insert 50 are each relieved around the hole 53 to accommodate a torsion spring 68. The spring, seen in Figure 4, is wrapped around pin 52 with its legs bearing against surfaces 62 and 64 thereby biasing the lower part (below hole 53) of the insert outwardly and the upper part (above hole 53) inwardly toward the opposing insert.

Figure 3 illustrates the entire hand tool, designated by the reference numeral 70. In addition to the handle 26 and the handle 30, the latter being pivotally connected to the former by a pin 71, the tool includes an actuating lever 72 which is pivotally mounted to the handle 30, and double links 74 which are pivotally mounted to each side of the handle 26 and to the lever 72. The arrangement of the handles and linkage is such that as the lever 72 is pulled away from the handles, the jaw members 24 and 28 move away relatively from each other. As the lever is pushed in towards the handles the jaw members approach each other.

Figure 6 illustrates a tubular connecting device for which the present invention was developed. The device, used to connect two flexible pipes 80 together, comprises an elongate body 82 having a centrally positioned annular groove 84 defined by two spaced annular flanges 86 and tubular extensions 88 extending longitudinally outwardly from the flanges 86. In addition, there are two pipe insert members 90 (only one of which is shown) which are inserted into the open ends of the pipes being connected, and two ferrule members 92 which are drawn onto the extensions 88 by the hand tool 70. Each ferrule member has at one end a flange 94.

In assembling the connecting device, the ends of the pipes 80, with insert members 90 in position inside, are pushed into the bore 96 of the body 82 as seen in Figure 6. The ferrule members 92, with flanges 94 facing toward the body groove 84, are pushed onto the tubular extensions 88 by hand as far as possible. Hand tool 70 is now placed onto the partially assembled device so that a body flange 86 is on the inside of one insert and the flange 94 on a ferrule member 92 is on the inside of the opposing insert. The upper curved edge portions 56 of each pair of inserts 50 is seen to define

a convergent mouth adapted to receive the partially assembled connecting device.

With reference to Figure 4 it can be seen that the inserts 50 pivot outwardly to permit the passing therethrough of the partially assembled connecting device which comes to rest in channels 38, after which, as can be seen in Figure 5, the inserts pivot back so that the channels 49 of the ribs 48 and the surfaces 58 of the inserts 50 almost completely surround the connecting device. The outwardly directed thrust surfaces of the ribs 48 and the inserts 50 bear against the thrust surfaces of the body flange 86 and the ferrule flange 94. Subsequent to the above positioning, the lever 72 is moved towards the handles 26 and 30 and to cause the jaw member 28 to approach the jaw member 24, drawing ferrule member 92 onto tubular extension 88 the process is performed on the opposite side of the connecting device to complete the connection.

While the embodiment of Figures 1 to 6 provides a semi-circular channel 49 and curved portions 58 which together define an arc of about 315 degrees, it is clear that the tool may be designed to provide a greater or less angular contact surface as desired. For example, in the embodiment of Figure 7, the inserts 50¹ have edges which are curved as at 59¹ and are designed to abut to define with the channel 49 of the rib 48 an angular contact surface of virtually 360°.

Furthermore, although two inserts 50 are shown, it is envisaged that a single insert having a surface 58 which would extend completely round the upper half of the tubular member may be used.

WHAT WE CLAIM IS:—

1. A hand tool for assembling a flanged first tubular member on to a flanged second tubular member comprising two relatively movable jaws, each jaw including a rib having a channel dimensioned to receive a respective one of the flanged tubular members such that the lateral thrust surface of the rib is engageable with a first portion of the thrust surface of the respective flange, and at least one insert having a first edge portion which in a first position of the insert complements the shape of the channel in the rib for engagement with a second portion of the thrust surface of the respective flange, the insert being pivotable about an axis extending parallel to the channel away from the first position to permit lateral entry of the tubular member into the channel.

2. A hand tool as claimed in claim 1, in which each insert is spring biased to the first position.

3. A hand tool as claimed in claim 1 or 2, in which each jaw has a second insert which is a mirror image of the first insert



(13)

and which is pivotable about an axis parallel to the channel but on the side of the channel opposite to the axis of the first insert.

4. A hand tool as claimed in claim 3, in which each insert of each jaw has a second edge portion which together with the second edge portion of the opposed insert defines a mouth for the reception of the tubular member.

- 10 5. A hand tool as claimed in any one of claims 1 to 4 in which the first edge portion

of the or each insert defines with the channel an arc of substantially 360 degrees.

6. A hand tool for assembling flanged first tubular member onto a flanged second tubular member, constructed and arranged, substantially as described with reference to and as illustrated in Figures 1 to 6 or Figure 7 of the accompanying drawings.

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